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ENERGY-SAVING TECHNOLOGIES IN GLASS PRODUCTION

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The practice of producing rolled sheet glass and polished glass for construction and engineering using energy-saving technologies is summarized.

The share of materials, fuel, and electricity in the cost of glass production in glass factories is on the average 74%. The way out of this situation lies in the development and implementation of resource- and energy-saving equipment and technologies for polished sheet glass production, and the transition to local material resources.

The Avtosteklo Company, which for more than two decades had been using traditional raw materials, in 1993 – 1994 in the course of continuous production, replaced the Bosnian dolomite and the concentrated feldspar from Ural in glass batch compositions by Donetsk dolomite (Elenovskoe deposit) and Prosyanovskoe kaolin. The latter materials are characterized by unstable chemical compositions and a high ferric oxide content.

After the transition to the new materials took place, the batch quality deteriorated, the optical parameters and technological properties of the glass being impaired (the light transmission per cm thickness dropped from 87 to 80%), which determined the need for technology upgrade.

In order to lower the energy consumption in batch preparation, two VA-248 mixers (electric-motor rating of 55 kW) were replaced by mixers VA-350 (rating of 18 kW). A new cyclogram structure was developed, which made it possible to shorten the batch preparation cycle by 21%. At the same time, technological waste was cut by a factor of 1.76.

An analysis indicated that the use of the specified types of Ukrainian materials deteriorated the light transmission of the glass melt, due to increased content of Fe_2O_3 in the glass. This made it necessary to raise the melting temperature.

Another glass composition, more suitable to these conditions, was developed and used in production for 3.5 years. This made it possible to decrease the maximum melting temperature and the temperature of the glass band in the active molding zone of the float-tank. The specific glass melt output increased by 5.5%. The glass quality with respect to its geometrical (difference in thickness) and optical parameters, as well as the homogeneity of the glass, were significantly improved. The rest of the glass properties met the standard requirements (GOST 111–90).

A technology using up to 100% cullet was implemented for the production of rolled (figured, reinforced) and polished sheet glass, allowing for abandoning traditional raw materials. The developed technology and the equipment for rolled glass contribute to a reduction in the energy and material consumption in production and improve the environmental conditions through reducing dust emissions in the areas of material preparation, weighing, mixing, and glass melting.

Over 6 months the production system for figured and reinforced glass with an increased content of cullet brought substantial material savings: 1276 ton soda ash, 4781 ton quartz sand, 354 ton dolomite, and 301 ton chalk. At the same time, the glass melt utilization factor and the product quality satisfied the standard requirements.

In the frame of the "Energy Saving" program, an integrated heat-insulating system was implemented on a large glass-melter at the float glass mini-line with rated capacity 80 ton/day.

In order to reduce the heat losses to the ambient medium, the roof of the melting zone was sealed with a paste and heat-insulated with quartz sand and chamotte-fiber plates ShPTG-450. The thermal insulation of the flame space walls in the melting zone consisted of two layers of refractories: light-weight chamotte ShL 1.3 and plates ShPGT-450.

The melting tank walls are heat-insulated by chamotte brick, ShPGT-450 plates, and on the outside are faced with

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steel sheets 3 mm thick. The enclosed charging hopper is also heat-insulated with chamotte plates. It is specifically designed for three plunger loaders made at the Avtosteklo Company.

The enclosed heat-insulated charging hopper and the new plunger loaders made it possible to work without using technical soda which had been used in this section in other glass-melting furnaces. The fuel consumption per ton of glass melt decreased by 9.5%, compared with a partially insulated furnace. The thermal losses to the ambient medium via the roof, suspended walls of the flame space, tank walls, and the charging hopper were significantly reduced.

The thermal insulation of the specified tank furnace elements made it possible to reduce the thermal losses via the charging hopper to 0.5%, in the melting part via the roof to 7.1%, and via the suspended walls to 0.25%. The overall decrease in thermal losses amounted to 13.5%.